The use of safety-seeking behavior in exposure-based treatments for fear and anxiety: benefit or burden? A meta-analytic review

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Abstract

There is a longstanding debate whether allowing safety-seeking behaviors (SSBs) during cognitive-behavioral treatment hampers or facilitates the reduction of fear. In this meta-analysis, we evaluate the impact of SSBs on exposure-based fear reduction interventions. After filtering 409 journal articles, 23 studies were included for systematic review of which 20 studies were coded for meta-analysis. For each study, the Standardized Mean Difference (*SMD* or Hedges' *g*) of self-reported fear was calculated at post-intervention. Two comparisons were distinguished: I) exposure without safety-seeking behavior (SSB-) versus baseline behavior (BL), and II) exposure with safety-seeking behavior (SSB+) versus BL. The results showed that average effect sizes were in favor of SSB-, (I: $SMD = 0.31$, 95% CI [-0.04, 0.66]), and in favor of BL, (II: $SMD = -0.13$, 95% CI [-0.37, 0.11]). Neither of the effect sizes were statistically significant (I: $Z = 1.75$, $p = .08$; II: $Z = 1.07$, $p = .28$). The current meta-analysis could not provide compelling evidence supporting either the removal or addition of SSB during exposure. More systematic and statistically empowered replications, using comparable research methods, in (non-)clinical settings are needed. Novel insights from fear conditioning research may also shed light on the role of SSB in fear reduction.

Keywords: safety-seeking behavior; exposure; fear; anxiety; meta-analysis; review

The use of safety-seeking behavior in exposure-based treatments for fear and anxiety: benefit or burden? A meta-analytic review

Anxiety disorders constitute one the most common forms of psychopathology, surpassing the prevalence of mood and substance abuse disorders, with a 12-month prevalence of 18.1% in the USA (Kessler, Chiu, Demler, & Walters, 2005) and a global 12-month and lifetime prevalence of 11.6% and 7.3% respectively (Baxter, Scott, Vos, & Whiteford, 2013), costing 74.4 billion per capita in Europe in 2010, and affecting over 69 million Europeans (Gustavsson, et al., 2011). Moreover, fear and anxiety are known to contribute significantly to the origins and maintenance of health-related pathology, such as chronic musculoskeletal pain (Vlaeyen & Linton, 2000, 2012), tinnitus (Cima, et al., 2012), chronic obstructive pulmonary disease (Janssens, et al., 2011), and cardiovascular disorders (Back, Cider, Herlitz, Lundberg, & Jansson, 2013).

Exposure therapy has a strong pedigree as one of the most potent cognitive-behavioral treatments to reduce disabling fear and anxiety (for a review, see Barlow, Raffa, & Cohen, 2002). The underlying idea is that fear is triggered by the erroneous interpretation of a cue as a warning signal for an impending catastrophe. This perceived threat turns the cue into a "*false alarm*" triggering unnecessary fear, e.g., panic patients may misinterpret interoceptive cues such as labored breathing, dizziness, and a "racing" heart, as warning signals for an upcoming panic attack (Salkovskis, 1996; Salkovskis, Clark, & Gelder, 1996). Exposure therapy can correct such misinterpretations and reduce fear by challenging these erroneous beliefs by testing an alternative hypothesis, e.g. that aversive interoceptive signals do not culminate into a full-blown panic attack or body injury (for an example of a protocol, see Barlow, 2002, 2008; Vlaeyen, Morley, Linton, Boersma, & De Jong, 2012). To provide such disconfirming evidence, patients are repeatedly confronted with the perceived threat cues without the expected catastrophe taking place. As a result, patients will learn that these stimuli are safe, which in turn reduces their capacity to elicit fear (Hermans, Craske, Mineka, & Lovibond, 2006).

Intriguingly, many anxiety patients appear to use subtle behavioral tricks or aids (e.g., Tang, et al., 2007) during such exposure exercises, assuming that these can prevent or minimize a feared catastrophe. For example, people with panic disorder may sit down when feeling dizzy to prevent a full-blown panic attack. These so-called "*safety-seeking behaviors*" (Salkovskis, 1996; Wells, et al., 1995) can be *adaptive* when they effectively reduce threat. In that case, these behaviors foster survival and contribute to the individual's well-being. However, in relatively safe situations (i.e. in response to "false alarm" cues) they may become *maladaptive*. For example, although providing temporary relief, safety-seeking behavior (SSB) during an exposure-based fear reduction procedure is thought to preserve excessive threat beliefs and to cause fear to return later on (Lovibond, Mitchell, Minard, Brady, & Menzies, 2009; Volders, Meulders, De Peuter, Vervliet, & Vlaeyen, 2012). Presumably this is because patients misattribute the absence of the catastrophe to their own behavior, which subsequently precludes the correction of misinterpretations and thus reinforces and preserves fear (Salkovskis, 1991, 1996; Salkovskis, et al., 1996; Wells, et al., 1995). Others have encouraged the judicious use of safety-seeking behavior, especially in the early stages of treatment because it makes treatment less aversive and reduces refusal and drop-out (Parrish, Radomsky, & Dugas, 2008; Rachman, 2012; Rachman, Radomsky, & Shafran, 2008; Rachman, Shafran, Radomsky, & Zysk, 2011; Sy, Dixon, Lickel, Nelson, & Deacon, 2011; van den Hout, Engelhard, Toffolo, & van Uijen, 2011).

Recently, two reviews provided preliminary evidence for the idea that correcting erroneous beliefs is indeed key to exposure therapy (McMillan & Lee, 2010), and that SSB might jeopardize such corrective learning (Helbig-Lang & Petermann, 2010). Because both reviews relied on systematic and narrative methods, no firm conclusions can be drawn with regards to the status of SSBs in exposure-based treatments. Considering the discernible presence of SSB in anxiety-related pathology and the ubiquitous use of exposure therapy, a better understanding of whether such behaviors indeed compromise treatment may help further improve the efficacy of exposure treatments. To determine whether the use of SSBs is a benefit or a burden, and to quantify the impact of SSB on exposure-based fear reduction, we performed a meta-analytic review.

Method

Search strategy and inclusion criteria

We performed a meta-analysis in accordance with the Cochrane Collaboration guidelines (Higgins & Green, 2008). We searched three major databases (PubMed, Web of Science, and Wiley Interscience Journals; for a detailed table of the keywords, see Appendix A) and manually searched the reference sections of relevant articles (see Figure 1 for a flowchart of the search and selection strategy). Articles were included if they 1) were published in the last 20 years (January 1995 – January 2015), 2) were written in English, 3) included an exposure-based intervention, 4) did not induce fear in healthy participants via experimental procedures such as fear conditioning, 5) included a manipulation of safety (-seeking) behavior, and 6) used an experimental design including a control condition. Authors were contacted if required details were missing in the published article.

– insert Figure 1 about here –

Rationale for inclusion in meta-analysis

To obtain a meta-analysis that allows for sensible interpretation, we established a common denominator by formulating one extra inclusion criterion: studies needed to include self-reported fear measures (i.e., fear ratings or validated questionnaires), serving as an outcome measure pre- and post-intervention.

Effect size estimation

Standardized Mean Difference. For each study, the primary self-reported outcome measure was selected (see Figure 2), after which post-intervention means are compared. A few studies included multiple post-intervention measurements (i.e., after a first and second session, or immediately after completion of the intervention and at a ten minute follow-up). If so, the latest post-intervention measure was included, assuming the strongest effects of the intervention. Subsequently, we calculated the overall effect size, Hedge's *g* (Hedges, 1984) and its 95% confidence interval (CI), which reflects the precision of the mean effect size. Hedges' *g*, further on referred to as the standardized mean difference (*SMD*), is a suitable statistic to standardize the results of studies measuring the same concept with different psychometric tools. This summary statistic is based on the difference in mean outcome between groups divided by the outcome's standard deviation. The *SMD* magnitude may be interpreted using Cohen's recommendations of small (.2), medium (.5) and large (.8) effect sizes (Cohen, 1988). All effect size calculations were performed with the RevMan software (The Cochrane Center, The Cochrane Collaboration, Copenhagen, Denmark).

Heterogeneity. Because there were different intervention types and outcome measures, we chose a random effects model, which essentially assumes that individual studies are estimating different treatment effects, which allows for the true effect to vary from study to study. A fixed-effects model would assume that any differences across studies are only due to sampling error, generating a single true effect for all studies. Under the random effects model however, true effects are assumed to have been sampled from a distribution of true effects. The summary effect is then the estimated mean of all relevant true effects (under the null hypothesis that this mean is 0). To obtain the most precise estimate of the overall mean, variance needs to be reduced as much as possible, including the within-study error, and the between-study variation in true effect. Hence, each study is weighted based on the inverse of the variance of the study (i.e., “inverse variance method”): the more variance, the less weight it is given.

Additionally, we inspected whether the observed variation is consistent with or greater than the expected variation due to sampling variation (i.e., actual variation between studies and within-study error). A useful statistic to quantify such heterogeneity is I^2, the ratio of true heterogeneity to the total observed variation that reflects real differences in the obtained effects, and the Chi-square test Q. The higher I^2, the more caution is needed when interpreting the inverse variance weighted *SMD*. According to Higgins, Thompson, Deeks, and Altman (2003), percentages of around 25%, 50%, and 75% are considered, as low, medium, and high, respectively. The same interpretation holds for Q: the higher Q, the larger the heterogeneity between studies.

Inclusion of multiple comparisons. To compare several intervention groups with the same control group, we included each pairwise comparison separately, while the shared control group was divided evenly among comparisons (see Comparison I, Figure 2 and Comparison II, Figure 3). Another current practice is to combine these different intervention groups to create and include a single pairwise comparison between intervention and control in the meta-analysis. However, given our limited number of studies within each of the meta-analyses, and the subtle differences between interventions, the latter method seemed to be less appropriate.

Results

Search results

The initial automatic and manual search generated 409 hits. All articles were subsequently scanned by one of the reviewers (SV) based on their title, reducing the total number of candidate articles to 90. For an overview of exclusion reasons, see Figure 1. Two of the authors (SV and TVD) then screened the articles based on abstract, resulting in the rejection of 67 more articles. Inter-rater reliability was high, with a 92% agreement (K = .79). Upon disagreement, potential study in/exclusions were discussed and resolved with consensus, resulting in a final sample of 23 journal articles retained for systematic description. In this sample, one article contained two studies, and two articles contained multiple comparisons. These were coded as separate studies, leading to a selection of 26 studies. While scrutinizing each journal article, three more articles were excluded from systematic description, which resulted in a total number of 23 studies selected for systematic description (see Figure 1 for exclusion reasons). For the meta-analyses, three more studies were excluded because no data was available (n = 2) or no *SMD* could be calculated (n = 1). This led to a final sample of 20 studies included in meta-analyses.

Systematic description

Design features. Most studies used a between-subjects design (see Table 2) while four studies used a within-subjects design. One within-subjects design study used an ABA phase change design to investigate whether safety-seeking behavior would lead to the exacerbation of existing symptoms in highly fearful students. This study did not apply an exposure task as such, but compared the effects of baseline use of safety-seeking behavior (BL) with a period in which participants were instructed to increase their safety-seeking behaviors (SSB+). In the other studies, a cross-over design was applied to compare the effects of removing safety-seeking behavior (SSB-) and baseline behavior (either with or without explicit instructions regarding the use of safety behavior), in a patient sample (Garcia-Palacios & Botella, 2003; Wells, et al., 1995) or in a student sample with high fear levels (McManus, Sacadura, & Clark, 2008).

Although the nature of the exposure tasks seemed to vary across studies, identical or similar tasks were used for specific fears, mostly consisting of one to three sessions that varied in length ranging from minutes to an hour per session, i.e., exposure to claustrophobic chamber, touching a contaminant, exposure to a social situation, approaching feared animals e.g., spider or snake.

Finally, most studies (*n* = 10) focused on idiosyncratic SSBs, meaning that these were tailored to the individual patients and situation. Four more studies provided participants with an already selected array of potential SSBs, and then allowed the participant to choose, whereas the rest of the studies (*n* = 9) chose to use the SSB identified by the researchers.

General features. Only six studies used a patient sample that met DSM-III or DSM-IV criteria for an anxiety disorder (*n* = 153 or 16% of the total N). An additional three studies used a nonclinical sample with the percentage of participants fully meeting DSM criteria ranging from 35% to 75%, the other studies used a nonclinical sample.

Five different types of fear were investigated (see Table 1), including: animal fear (i.e., snakes, spiders, *n* = 3) claustrophobia (*n* = 4), contamination fear (*n* = 4) , panic disorder with agoraphobia (*n* = 2), and social anxiety (i.e., social phobia, generalized anxiety disorder, *n* = 10). The social anxiety and panic disorder studies seem to converge on the idea that SSB is detrimental to exposure-based fear reduction. Allowing the use of SSB was found to be associated with less fear reduction and belief change (Garcia-Palacios & Botella, 2003; Kim, 2005; Morgan & Raffle, 1999; Wells, et al., 1995), with making the individual appear more anxious in the eyes of an observer (McManus, et al., 2008), and stimulating gaze avoidance (i.e. promoting safety-seeking behavior) led to sustained or increased social anxiety (Langer

& Rodebaugh, 2013), whereas eliminating these SSBs appeared to be related to less negative and more accurate judgments of one's own social performance (Taylor & Alden, 2010). In addition, increasing eye contact (i.e. eliminating SSB) was associated with reduced anxiety during social interactions (Langer & Rodebaugh, 2013). Fear reduction and belief change in panic patients (Salkovskis, Clark, Hackmann, Wells, & Gelder, 1999; Salkovskis, Hackmann, Wells, Gelder, & Clark, 2007) was more powerful when SSB was omitted during treatment and when the aim was to change threat beliefs explicitly, i.e. guided threat focus and reappraisal strategies.

Interestingly, these findings are not unequivocally supported by studies addressing contamination fear and claustrophobia. One study concluded that SSB could be involved in the exacerbation of contamination fear symptoms (Deacon & Maack, 2008), another study reported that even the mere availability of SSB could disrupt treatment for claustrophobic fear (Powers, Smits, & Telch, 2004; Sloan & Telch, 2002b). Rachman and Hodgson (Rachman & Hodgson, 1980) were to first to categorize SSB in the context of contamination based on its function (preventive *vs*. restorative). *Preventive safety* behaviors typically refer to actions that are performed to attenuate one's emotional response to an anticipated threat. For example, in the case of OCD, avoiding public restrooms can be labeled as a preventive safety behavior. *Restorative safety behaviors*, on the other hand, refer to corrective actions used to remedy a distressing situation back to the desired state and restore safety from the occurrence of threat. For example, in the case of OCD, using a hand sanitizer to restore cleaniness after contact with germs (these examples are borrowed from Goetz & Lee, 2015; see also Helbig-Lang & Petermann, 2010). Following this functional categorization, another study on contamination fear concluded that preventive safety behavior might have detrimental effects on treatment whereas restorative safety behavior might be beneficial (Goetz & Lee, 2015).. A third claustrophobia study failed to replicate these deleterious effects (Sy, et al., 2011).

Additionally, van den Hout et al. (2011) and Rachman et al. (2011) each showed a stronger reduction of contamination feelings in the presence of SSB. The latter finding is supported by studies on animal fear as well. Snake– (Milosevic & Radomsky, 2008) and spider–fearful (Hood, Antony, Koerner, & Monson, 2010) participants showed reductions in fears and fearful beliefs with and without SSB. Another study showed that safety gear improved approach to a live spider, but the spider phobics who did not use the safety gear reported more perceived control (Milosevic & Radomsky, 2013) which might be important for long term fear reduction and relapse prevention. SSB helped participants move quicker towards the feared animal, although no group differences were detected by the end of the test and beneficial changes were not sustained at one-week follow-up (Hood et al., 2010). Deacon et al. (2010) failed to show the specific advantages of SSB proposed by Rachman et al. (2008), but it did not appear to be counter-therapeutic either. Besides Hood et al. (2010) and Deacon et al. (2010) only two more studies included a follow-up measure after one to two weeks (Powers, et al., 2004; Sloan & Telch, 2002a). The overall trend at follow-up suggests less beneficial effects when SSB was present during the intervention compared to when it was not available or not addressed at all.

– insert Table 1 about here –

– insert Table 2 about here –

Rationale for multiple meta-analyses

A thorough examination of our studies revealed that they typically focused on three different types of exposure. A first is a variable baseline (BL) condition which functions as a control. In this condition, participants either receive instructions to use SSBs or received no instructions at all. The second and third condition are the experimental conditions: 2) an exposure without SSB (SSB-) condition, in which participants are aware of SSB, but are instructed to drop or decrease it or are explicitly denied access to it, and 3) an exposure with the use of SSB (SSB+) condition, in which participants are aware of SSB and are requested to increase or maintain it. A single meta-analysis across the entire study sample was therefore considered impossible: because of different operationalizations of the intervention and control groups, averaging effects for both groups across studies would not allow for a sensible interpretation of the overall effect size. Hence, in line with the current debate as to whether adding or removing SSB during exposure-based fear reduction interventions is more desirable, we performed two separate comparisons and meta-analyses. Comparison I (N = 11 studies) focused on studies that are addressing the differential effects of removing SSB (SSB-) from a baseline condition (BL). Comparison II (N = 9 studies) focused on the differential effects of exposure with the use of SSB (SSB+) versus a baseline condition (BL).

Synthesis of meta-analyses

Bias. Because of the limited number of studies included in the two meta-analyses, we could not formally test for publication bias. Nevertheless, the possibility of such a bias should be kept in mind. Furthermore, a risk of bias analysis was conducted to assess selection bias; the results can be found in Figures 2 and 3.

Comparison I: **BL vs. SSB-.** Eleven studies compared maintaining baseline (n = 213) with removing safety behavior (n = 224). Individual effect sizes are presented in Figure 2. Seven studies are inconclusive, with five negative, small effect sizes (-0.01 to -0.43) and one positive medium effect size (0.62). Four studies suggest that removing SSB is more beneficial than maintaining BL, with large effect sizes (0.96 to 1.84). The overall effect size is small and non-significant (SMD = 0.31, 95% CI [-0.04, 0.66], p = .08). As the study by Kim (2005) compared two interventions with the same control group, an additional sensitivity analysis was undertaken, in which only the intervention with the most comprehensive treatment group was included. The overall results remained non-significant, with an *SMD* of 0.26 (95% CI = [-0.10, 0.62], $p = .06$), indicating that including both studies does not bias our results. There is however a high level of heterogeneity ($I^2 = 66\%$), which implies an increased chance that the amount of variance seen is not simply due to random error. The risk of bias analysis furthermore shows that all studies are at risk for bias, particularly performance bias and detection bias, except for the Taylor & Alden (2010) studies.

– insert Figure 2 about here –

Comparison II: BL vs. SSB+. The results of the second comparison are displayed in Figure 3. Nine studies compared the effects of maintaining BL ($n = 225$) with adding safety behavior ($n = 237$). Eight studies are inconclusive with small negative effect sizes (-.03 to -.36) and one with a small positive effect (.45). Furthermore, one study reports a large effect in favor of maintaining baseline (-1.28). The overall effect size is negative, small and does not reach statistical significance (*SMD* = -0.13 (95% CI [-0.37, 0.11], $p = .28$). Furthermore, there is a medium level of heterogeneity ($I^2 = 35\%$), which implies a chance that the amount of variance observed is simply due to random error. Furthermore, when conducting a risk of bias analysis, results show that all studies in this comparison are also at risk for (performance and detection) bias, particularly the Deacon and Maack (2008) study, which is also at risk for selection bias.

– insert Figure 3 about here –

Discussion

In the current meta-analysis, we evaluated whether engaging in safety-seeking behavior (SSB) has beneficial or deleterious effects on exposure-based fear reduction. Twenty-three studies were withheld for systematic review, 20 of those were included in the meta-analysis.

SSB has been found to be associated with the exacerbation (Deacon & Maack, 2008) or maintenance (McManus, et al., 2008; Taylor & Alden, 2010) of symptoms, with less cognitive change (e.g., a shift in beliefs about the feared event) (Garcia-Palacios & Botella, 2003; Kim, 2005; Salkovskis, et al., 1999; Wells, et al., 1995), with less fear reduction (Garcia-Palacios & Botella, 2003; Kim, 2005; Morgan & Raffle, 1999; Salkovskis, et al., 1999; Salkovskis, et al., 2007; Wells, et al., 1995) and with potentially less sustainable change at follow-up (Hood, et al., 2010) or more return of fear (Rachman, et al., 2011). However, even though the benefits of judicious SSB are not empirically supported, it does not necessarily prevent therapeutic progress (Deacon, Sy, Lickel, & Nelson, 2009), nor does it preclude a reduction of fear (Rachman, et al., 2011; Sy, et al., 2011; van den Hout, Engelhard, Toffolo, & van Uijen).

In essence, the current meta-analysis was inconclusive and could not provide strong evidence supporting either the removal or addition of SSB during exposure-based treatment. Comparison I, in which we compared maintaining baseline behavior and exposure without SSB yielded a small, borderline significant overall effect size in favor of omitting SSB. Comparison II, in which we compared maintaining baseline behavior and exposure with SSB yielded a small, non-significant overall effect size in favor of maintaining baseline behavior. Taken together, these findings did not corroborate the results of a recent randomized controlled trial showing a better efficacy of a unified and trans-diagnostic treatment aimed at eliminating SSB in several anxiety disorders compared to a waiting list group (Schmidt, et al., 2012).

A few issues merit further attention. A first potential reason for divergent research findings may be related to the conceptualization of SSB. The definition of SSB as a strategy aimed to prevent or minimize a feared catastrophe (Salkovskis, 1991, 1996) emphasizes the underlying behavioral intention, or its idiosyncratic character: what functions as a SSB for one patient, may not be so for another. Although we explicitly included studies referring to SSB, it is unsure to what extent these studies employed the same definition. Discrepant research findings may thus be partly attributed to variability in conceptualization and operationalization. Yet, the majority of the present studies did take the idiosyncratic nature of SSB into account. Our findings however are only partially in line with an earlier systematic review that explicitly defined SSB (as encompassing distraction, neutralization, control of bodily symptoms, and compulsive behavior) and included studies accordingly (Helbig-Lang & Petermann, 2010). Based on their review the authors suggested that abandoning SSB throughout therapy is recommended; in our meta-analysis the comparison between baseline behavior and the removal of SSB only rendered a small and borderline significant effect size (p =.08) in favor of removing SSB during exposure treatment. The lack of evidence supporting dropping SSB in this meta-analysis is quite surprising given its predominance in theory and clinical practice to date. The discrepancy with recent narrative reviews might be partly explained by the focus on one single outcome measure, i.e. self-reported fear, which might limit the scope of our understanding of the results. On the other hand, the procedure of the meta-analysis is a standardized approach that involves some necessary abstraction of specific features of studies and calculates an overall effect size based on weighted estimates of individual study effect sizes. Therefore, it is possible that the combined evidence does not reflect the results of individual studies very well. There are several reasons for this: 1) individual studies might have been underpowered (small sample size), 2) individual studies might have focused on reporting p-values rather than effect sizes (if sample size is large, significant results might have been reported, although the effect size could be small and the effects clinically not meaningful).

A second reason for inconsistent findings might be that fear is mostly measured during or immediately after the exposure-based intervention, which is considered an index of successful corrective learning: the lesser fear is expressed, the better exposure worked. However, Craske et al. (2008) showed that performance, i.e., the level of fear that is expressed during or at the end of exposure, nor the degree to which fear reduces during an exposure session reliably predicts treatment success (i.e. differences between within-session *vs*. between-session fear reduction). Additionally, it is currently assumed that fear reduction after exposure is about learning to inhibit fearful responding upon confrontation with the threatening cue (Bouton, 2006; Craske, et al., 2008a). If so, our current research question is best answered by measuring fear at follow-up and during confrontation with a threatening cue rather than by performance during exposure. Moreover, studies should be careful to presume (dis)advantageous effects of SSB's based on performance or fear levels during an exposure task (e.g., Hood et al., 2010). A separate meta-analysis to compare effects at follow-up could be relevant to answer our research question, but the small number of studies (n = 4, across the different comparisons) including a follow up (1 to 2 weeks) precluded this option. Hence, a strong evidence-based conclusion cannot be drawn at this point.

A third reason that may explain the inconsistency in the observed results across studies, is that there may be individual differences in the *motivational context* in which apparent SSB occurs. That is, similar behaviors may serve dissimilar goals and thus the *functionality of behaviors* typically labeled as SSB might vary massively across patients. In a recent experimental pain-related fear conditioning study, Volders et al., (2014) indeed showed that allowing participants to use SSB led to faster immediate fear reduction but also to more return of fear once the SSB was omitted when this SSB was introduced as a way to avoid the painful stimulus (i.e. pain avoidance goal), but not when the same SSB was introduced as a way to improve task performance, which could double the monetary reward (i.e. achievement goal). In the same vein, patients that use SSB as a means to achieve an important life goal may benefit from it, whereas SSB used to avoid a feared catastrophe may become a burden.

In moving the debate about SSB and fear reduction a step forward, it may be useful to draw on general anxiety theories which assume that learning principles such as classical conditioning underlie the development of fear as well its reduction (for a review, see Lissek, et al., 2005). A major advantage is that these theories can be falsified via laboratory procedures allowing control over and manipulation of the development and reduction of fear (Acheson, Forsyth, Prenoveau, & Bouton, 2007; Bouton, Mineka, & Barlow, 2001; e.g., Bradley, Silakowski, & Lang, 2008; Grillon & Davis, 1997; Meulders, Vansteenwegen, & Vlaeyen, 2011; Meulders & Vlaeyen, 2012). Using such methods, a particularly interesting finding is that the presence of a subtle avoidance response during a laboratory fear reduction procedure initially facilitates fear reduction, but causes fear to return more easily when this response is omitted (Craske, et al., 2008b; Hermans, et al., 2006; Lovibond, Davis, & O'Flaherty, 2000; Lovibond, et al., 2009; Rescorla, 2003; Volders, et al., 2012). This seems highly compatible with the idea that SSB, often presenting as subtle avoidance, facilitates fear reduction initially but maintains fear in the long run.

Furthermore, the translation of research into clinical applications should be encouraged and fine-tuned. In the current study sample, only one single-case study (Garcia-Palacios & Botella, 2003) and one patient study (Wells, et al., 1995) tested the efficacy of a more elaborate multi-session cognitive-behavioral therapy program. Nonetheless, methodological approaches such as replicated single case experiments (Bulté & Onghena, 2008; Onghena & Edgington, 2005) that allow for more in-depth and ecologically valid studies, that advance treatment recommendations and inspire new theoretical predictions are available but are hardly implemented (for examples, see Anderson, Rothbaum, & Hodges, 2003; Vlaeyen, de Jong, Geilen, Heuts, & van Breukelen, 2002). To our knowledge, the present study is the first to apply a meta-analytic approach to answer a fundamental question that has fueled an ongoing and irresolute debate amongst behavioral theorists and clinicians.

Still, a few limitations should be noted. *First*, the level of heterogeneity was high in both meta-analytic comparisons. This could be due to the variability between studies in terms of the type of fear, the sample characteristics, the outcome measure used, and specific design features. This warrants a cautious interpretation of results. *Second*, the sample of studies included in the meta-analysis (and in each comparison) was relatively small. Obviously, this has several implications: It cannot be ruled out that the observed non-significant results may simply reflect a lack of statistical power. Also, we could not formally test for publication bias; and we were unable to formally test for the influence of moderating variables such as the type of fear, the specific SSB, the length or frequency of exposure sessions, the fear levels of participants (e.g., nonclinical, subclinical, or clinical). Clearly, conclusions are cautious and should be drawn with these limitations in mind. *Third* and finally, we are aware that fear is often measured via a Behavioral (Approach) Test (B(A)T), in which more avoidance indicates more fear. B(A)T performance can be measured in various ways, including approach distance to a feared object, most experienced fear during the task ("peak fear"), average fear experienced across the entire task, or fear experienced at pre-set assessment points during the task. However, because of the limited number of studies that used similar operationalizations of B(A)T performance, our main outcome measure had to be operationalized via self-reports. Although we believe that reduction in verbal fear report is a good proxy for treatment success as it is generally associated with increased (daily) functioning and reduced avoidance behavior, we acknowledge that there is no 1-to-1 relationship between verbal fear reports and functioning/avoidance behavior. Therefore focusing on changes in fear tolerance, fear beliefs, behavioral avoidance, or self-efficacy might yield different results, and in that sense, this meta-analysis focusing on one single outcome measure might limit the scope of our understanding of this literature.

To conclude, the present meta-analysis aimed to quantify the effects of SSB on exposure-based fear reduction in anxiety disorders that have previously only been reviewed systematically. The results of this meta-analysis were inconclusive and no clinical recommendations can be made based on this study regarding adding or removing SSB in exposure-based treatments. Our results further highlight the need for more systematic replications with sufficient statistical power and large sample sizes, using comparable research methods in clinical and non-clinical settings. Future research should consider drawing upon contemporary learning theory to generate more rigorous, fundamental-experimental research.

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Contributors

AM, SV, and JWSV designed the study and SV wrote the protocol. TVD and SV conducted literature searches and provided summaries of previous research studies. SV and TVD conducted the statistical analysis. AM and SV wrote the first draft of the manuscript and all other others contributed to and have approved the final manuscript.

Conflict of interest

All authors declare that they have no conflict of interest.

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Figure Captions

Figure 1. Flowchart of the search and selection strategy.

Figure 2. Comparison I: Exposure without safety-seeking behavior (SSB-) versus baseline behavior (BL). Effect sizes are presented as the Standardized Mean Difference (*SMD*) at post-intervention. 95% confidence intervals (CI) are represented by the horizontal lines for each study. The black diamond represents the aggregated SMD, the width of the diamond represents the aggregated 95% CI.

Figure 3. Comparison II: Exposure with safety-seeking behavior (SSB+) versus baseline behavior (BL). Effect sizes are presented as the Standardized Mean Difference (*SMD*) at post-intervention. 95% confidence intervals (CI) are represented by the horizontal lines for each study. The black diamond represents the aggregated SMD, the width of the diamond represents the aggregated 95% CI.

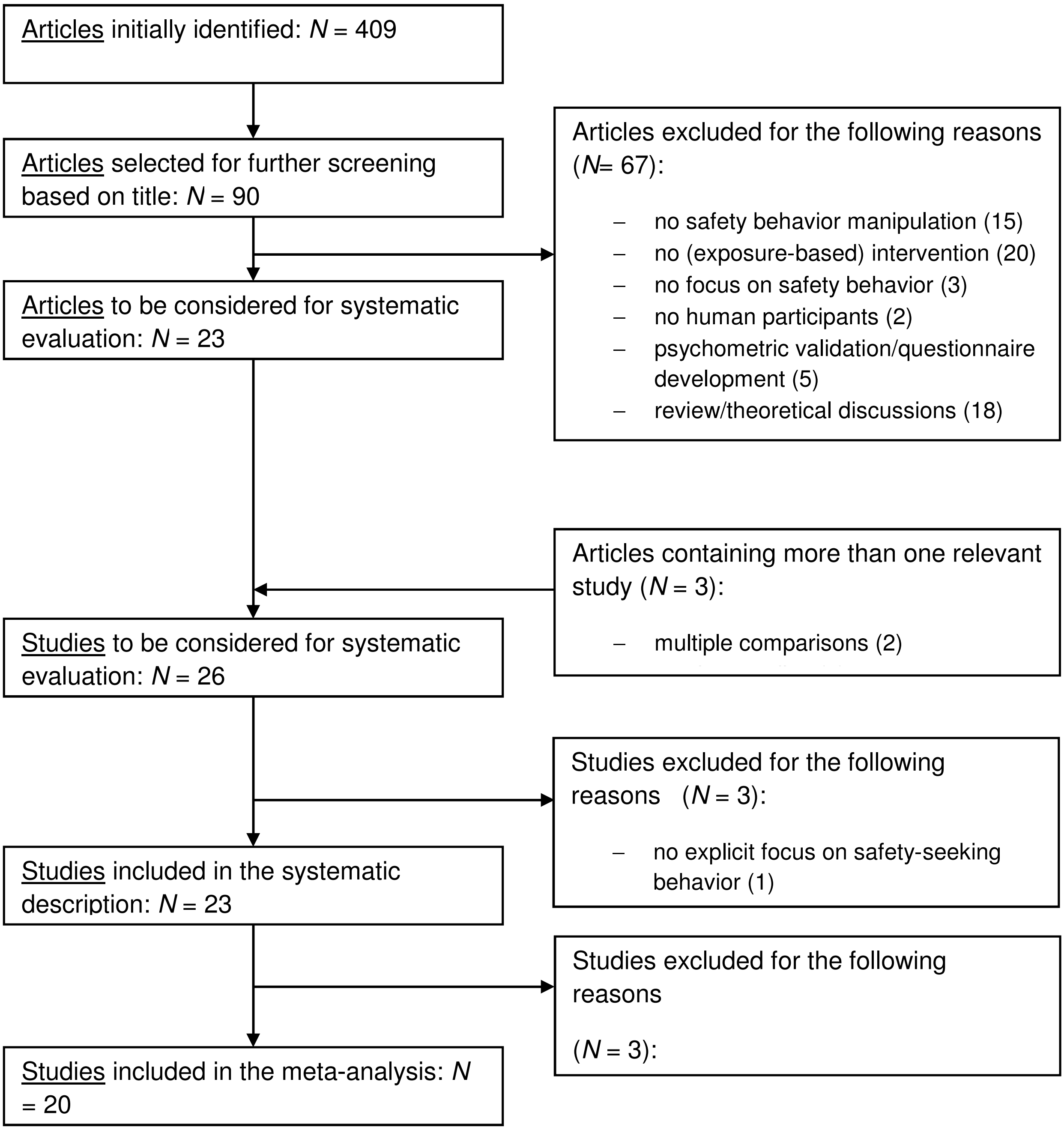


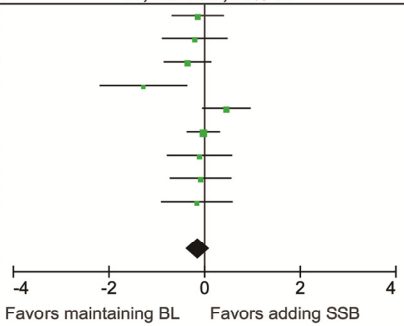
Figure 1. Flowchart of the search and selection strategy.

Study or Subgroup	maintaining BL Mean	maintaining BL SD	maintaining BL Total	adding SSB Mean	adding SSB SD	adding SSB Total	Weight	Std. Mean Difference IV, Random, 95% CI	Risk of Bias A	B	C	D
Deacon & Maack, 2008	1.94	1.65	26	2.21	2.05	26	12.3%	-0.14 [-0.69, 0.40]	−	−	−	−
Deacon et al., 2010	11.71	8.51	17	13.38	7.20	16	9.0%	-0.21 [-0.89, 0.48]	+	+	−	−
Goetz & Lee, 2015	21.64	27.71	25	32.19	29.98	42	13.6%	-0.36 [-0.86, 0.14]	+	+	−	−
Langer & Rodebaugh, 2013 - 1	08.87	2.59	15	12.56	3.09	9	5.7%	-1.28 [-2.20, -0.36]	+	+	+	+
Milosevic & Radomsky, 2008	66.00	28.61	31	52.98	27.93	31	13.4%	0.45 [-0.05, 0.96]	+	+	−	−
Milosevic & Radomsky, 2013	54.78	27.14	63	55.44	24.2	63	19.4%	-0.03 [-0.37, 0.32]	+	+	−	−
Powers et al., 2004	17.41	11.57	17	18.63	10.92	16	9.0%	-0.11 [-0.79, 0.58]	+	+	−	−
Sloan & Telch, 2002	11.50	5.60	19	12.06	7.38	18	9.8%	-0.08 [-0.73, 0.56]	+	+	−	−
Sy et al., 2011	27.31	14.61	12	29.5	11.89	16	7.8%	-0.16 [-0.91, 0.59]	+	+	−	−
Total (95% CI)			**225**			**237**	**100.0%**	**-0.13 [-0.37, 0.11]**				

Heterogeneity: Tau² = 0.05; Chi² = 12.36, df = 8 (P = 0.14); I² = 35%

Test for overall effect: Z = 1.07 (P = 0.28)

Std. Mean Difference
IV, Random, 95% CI



Risk of bias legend

(**A**) Random sequence generation (selection bias)

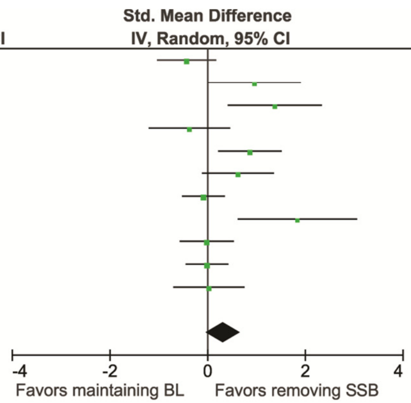
(**B**) Allocation concealment (selection bias)

(**C**) Blinding of participants and personnel (performance bias)

(**D**) Blinding of outcome assessment (detection bias)

	maintaining BL			removing SSB				Std. Mean Difference	Risk of Bias			
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Random, 95% CI	A	B	C	D
Hood et al., 2010	65.91	27.59	22	76.67	20.71	21	10.2%	-0.43 [-1.04, 0.17]	+	+	−	−
Kim, 2005 - 1	56.67	13.45	7	44	12.42	15	7.1%	0.96 [0.01, 1.91]	+	+	−	−
Kim, 2005 - 2	56.67	13.45	8	32.67	18.31	15	7.0%	1.37 [0.41, 2.34]	+	+	−	−
Langer & Rodebaugh, 2013 - 2	8.87	2.59	15	10.00	3.39	9	8.0%	-0.38 [-1.21, 0.46]	+	+	+	+
McManus et al., 2008	44.25	20.54	20	27.00	18.52	20	9.8%	0.86 [0.21, 1.52]	?	−	−	−
Morgan & Raffle, 1999	129.21	25.19	14	112.62	26.73	16	8.9%	0.62 [-0.12, 1.36]	+	+	+	−
Rachman et al., 2011	2.95	10.29	40	3.88	10.76	40	12.0%	-0.09 [-0.53, 0.35]	+	+	−	−
Salkovskis et al., 2006	35.00	14.90	8	11.10	9.00	8	5.3%	1.84 [0.61, 3.06]	+	+	−	−
Taylor & Alden, 2010 - 1	13.04	3.35	25	13.12	4.56	25	10.8%	-0.02 [-0.57, 0.53]	+	+	+	+
Taylor & Alden, 2010 - 2	14.45	3.66	40	14.50	3.61	40	12.0%	-0.01 [-0.45, 0.42]	+	+	+	+
van den Hout et al., 2011	81.80	22.30	14	81.30	15.5	15	9.0%	0.03 [-0.70, 0.75]	+	+	−	−
Total (95% CI)			**213**			**224**	**100.0%**	**0.31 [-0.04, 0.66]**				

Heterogeneity: $Tau^2 = 0.22$; $Chi^2 = 29.59$, df = 10 (P = 0.0010); $I^2 = 66\%$
Test for overall effect: Z = 1.75 (P = 0.08)



Risk of bias legend
(**A**) Random sequence generation (selection bias)
(**B**) Allocation concealment (selection bias)
(**C**) Blinding of participants and personnel (performance bias)
(**D**) Blinding of outcome assessment (detection bias)

Table 1. *Description of general study characteristics*

Author(s) & publication year	**Type of fear**	**Sample**	**N**	**% meeting DSM criteria**	**Study focus**	**Findings & conclusion**
1. Deacon & Maack, 2008	Contamination fear	Students with high fear	26	_	SSB+ association with symptom exacerbation	Significant increases in threat overestimation, contamination fear, emotional and avoidant responses to BAT, after 1 week of using SSB. No clear effects on anxiety and depressive symptoms. → SSB may contribute to emotional, cognitive and behavioral aspects of contamination fear, independent of initial baseline fear level.
2. Deacon et al., 2010	Claustrophobic fear	Students	33	39.4 fully, 36.4 without functional impairment (DSM-IV)	Judicious use of SSB+ in augmenting exposure therapy	Generally equivalent results for both groups, but no clear confirmation of benefits of judicious use of SSB. → Allowing individuals to engage in SSB during exposure therapy is not necessarily counter-therapeutic.
3. Garcia-Palacios & Botella, 2003	Social phobia	Patient referred for treatment	1	100 (DSM-IV)	SSB- versus baseline treatment in a single case	Greater decrements of avoidance, anxiety, performance and belief in visibility of shaking in SSB- than BL. → SSB- is more effective than BL.
4. Goetz & Lee,2015	Contamination fear	Students	67	_	Preventive SSB or restorative SSB versus baseline	Restorative SSBs may be beneficial as an adjunct to therapy, whereas preventive SSBs might be potentially detrimental.
5. Hood et al., 2010	Spider fear	Student and community volunteers with high fear	43	35	SSB+ association with subjective fear and cognitive change at FU	Approach behavior quicker established with SSB+ than SSB-, but in the end the same overall approach in both groups. → SSB does not unambiguously prevent belief disconfirmation, although changes are less durable.
6. Kim, 2005 – 1	Social anxiety	Students with high fear	30	_	SSB effect on anxiety and negative thoughts; via exposure only with extinction rationale?	More fear reduction in SSB- than BL with extinction rationale. → SSB- with a cognitive rationale produces greater fear and belief changes than BL and SSB- with an extinction rationale.
7. Kim, 2005 – 2	Social anxiety	Students with high fear	30	_	SSB effect on anxiety and negative thoughts; via exposure only with cognitive rationale?	More fear reduction in SSB- than BL and even better compared to SSB-with extinction rationale. → SSB- with a cognitive rationale produces greater fear and belief changes than BL SSB- with an extinction rationale
8. Langer & Rodebaugh, 2013 – 1	Social anxiety	Students with high social anxiety	24*	_	SSB+ (reducing gaze avoidance) effect on anxiety in students with higher anxiety during social conversations amongst peers	Being instructed to make less eye contact (SSB+) was more anxiety-provoking compared to being asked to increase eye-contact (SSB-).
9. Langer & Rodebaugh, 2013 – 2	Social anxiety	Students with high social anxiety	24*	_	SSB- (stimulating gaze avoidance) effect on anxiety in students with higher anxiety during social conversations amongst peers	Being instructed to make less eye contact (SSB+) was more anxiety-provoking compared to being asked to increase eye-contact (SSB-).
10. McManus et al., 2008	Social anxiety	General population with high fear	20	_	SSB+ association with self-focus on anxiety and other worse outcomes than SSB-	Participants felt more anxious after using SSB, also for anxious appearance and overall performance. → Evidence for cognitive models of social phobia claiming that SSB and self-focused attention maintain it.
11. Milosevic & Radomsky, 2008	Snake fear	Students with high fear	62	_	SSB+ and benefits of exposure	Both groups improved, but more approach in first stages of BAT with SSB. No group differences 10 minutes later.

						→ SSB does not necessarily interfere with exposure treatment.
12. Milosevic & Radomsky, 2013	Spider fear	General population with high fear	126	_	SSB and belief change during a behavioral experiment	Safety gear facilitated close approach to the spider, however those who did not use safety gear experienced greater improvement in perceived control.
13. Morgan & Raffle, 1999	Social phobia	Patients with social phobia	30	100 (DSM-IV)	SSB- & CBT compared to normal CBT for efficacy	Improvements in both groups for specific and general measures, but larger effect size in SSB- & CBT than normal CBT for specific measures. → Instructions to drop SSB were a useful addition to a standard CBT treatment for social phobia.
14. Powers et al., 2004	Claustrophobic fear	Students with high fear	72	75 fully, 25 without functional impairment (DSM-IV)	Perceived availability of threat-relevant SSB compared to BL and to actual use of SSB	Statistically and clinically significant pre-post changes for all measures, with BL outperforming the two SSB+ groups (use and availability of SSB). This is line with Sloan & Telch, 2002. More FU improvement in BL group. → Making SSB available during in vivo exposure has a marked disruptive effect on fear reduction.
15. Rachman et al., 2011	Contamination fear	Students with moderately high contamination fear	80	_	SSB+ and the reduction of feelings of contamination compared to SSB-	Significant reduction in feelings of contamination, disgust, fear and danger, in both groups, but stronger for SSB+ . More reduction of contamination in SSB+ and more return of contamination and fear in SSB+ group than in the SSB- group. → SSB does not preclude the reduction of contamination fear.
16. Salkovskis et al., 1999	Panic disorder with agoraphobia	Patients referred for treatment	18	100 (DSM-III-R)	SSB+ and the prevention from benefiting from a discomforting experience	More belief change and fear reduction in SSB- than in BL, as shown in questionnaires of clinical anxiety as well as seen in a behavioral test two days after the brief exposure period. → Evidence for the hypothesis that SSB can play a role in maintaining key threat beliefs.
17. Salkovskis et al., 2006	Panic disorder with agoraphobia	Patients referred for treatment	16	100 (DSM-III-R)	SSB+ and SSB- impact on fear habituation and belief disconfirmation	Significant more pre-post improvement for SSB- than SSB+ for self-reported fear and BAT peak fear. → Exposure based on belief disconfirmation and dropping SSB is clinically more effective than exposure based on habituation and maintaining SSB.
18. Sloan & Telch, 2002	Claustrophobic fear	Students with severe claustrophobic fear	46	_	SSB+ association with pre-post fear reduction and return of fear at FU, compared to BL and to guided threat reappraisal	As expected: more improvement in E+GTR (exposure with guided threat focus and reappraisal) (best result) and BL than in SSB+ for peak fear during a behavioral test and claustrophobic fear. Many of the between-group differences are maintained at FU. → SSB can interfere with fear reduction while guided threat focus and reappraisal can enhance it.
19. Sy et al., 2011	Claustrophobic fear	Students with high fear	58	46.6 fully, 20.7 without functional impairment (DSM-IV)	Replication of Powers et al., 2004	Failure to replicate Powers et al., 2004, no group differences in fear reduction. → These findings are inconsistent with the idea that SSB is associated with greater misattributions of safety and worse outcomes.
20. Taylor & Alden, 2010 – 1	Social anxiety	Students with high levels of social anxiety	50	_	Causal role of SSB in the maintenance of judgmental biases associated with SAD?	SSB- was associated with less negative and more accurate judgments of own social performance. → SSB causally involved in persistence of negative social

						judgments; this is consistent with a cognitive view on SSB and anxiety.
21. Taylor & Alden, 2010 – 2	Generalized social anxiety disorder	Patients referred for treatment	80	100 (DSM-IV)	Causal role of SSB in the maintenance of judgmental biases associated with SAD?	Replication of study 1 of Taylor & Alden, 2010 → Replication: SSB causally involved in persistence of negative social judgments.
22. van den Hout et al., 2011	Contamination fear	Students with at least moderate fear	44	_	Replication of Rachman et al., 2011	Replication of Rachman et al., 2011: Significant drops in fear, contamination, disgust and danger in all groups, in both sessions, more pronounced drop in contamination feelings for SSB+ group and a return of CFDD between sessions. → Findings of Rachman et al. 2011 seem robust, SSB does not necessarily interfere with fear reduction.
23. Wells et al., 1995	Social phobia	Patients with social phobia	8	100 (DSM-III-R via SCID)	SSB- effectiveness compared to BL	Greater mean decrements for anxiety and beliefs in SSB- than in BL. → SSB should be identified and eliminated during exposure therapy.

Note. DSM = Diagnostic and Statistical Manual of Mental disorders; SCID = Structured Clinical Interview for DSM disorders; BAT = Behavioral Avoidance Test; BL= Baseline; SSB = Safety-seeking behavior; SSB- = Exposure without safety-seeking behavior; SSB+ = Exposure with safety-seeking behavior; FU = follow-up; SAD = Social Anxiety Disorder; CFDD = Contamination, Fear, Danger, and Disgust.* Please note that for this study only the high social anxious participants (Social Interaction Anxiety Scale scores > mean + 1 SD (Mattick & Clarke, 1998)) were included in the meta-analysis.

Table 2. *Description of relevant study design features*

Author(s) & publication year	Design	Procedure	Exposure task	Exposure duration	Type of SSB	# Groups	Follow-up	SSB
1. Deacon & Maack, 2008	WS ABA phase change	Baseline SSB use → increase of SSB use → return to baseline SSB use	No exposure task	3 week program	Selected by researchers, then idiosyncratic choice	1	_	SSB+
2. Deacon et al., 2010	BS	Rating after each exposure trial	Exposure to claustrophobic chamber	1 session: 6 x 5 min	Idiosyncratic covert SSBs (distraction, reassurance, neutralization)	2	1 week	SSB+
3. Garcia-Palacios & Botella, 2003	WS cross-over, single case	Diary measures during 10d BL and 10d SSB-	Rationale + exposure with therapist + self-exposure	2 sessions (1.30min + 2hrs), self-exposure exercises (7x in week 1, 6x in week 2)	Idiosyncratic SSBs	2	_	SSB-
4. Goetz, & Lee, 2015	BS	Rating every time, allow SSB or not before or after touching a idiosyncratic contaminant	Touching a contaminant	1 session: 15 trials of 20 seconds	Selected by researchers, then idiosyncratic choice	3	_	SSB+
5. Hood et al. , 2010	BS	Comparing fear reduction and approach rate during two exposure tasks	Exposure (approaching) to a live spider at own pace	2 sessions: 5 min+ 30 min resp.	Selected by researchers, then idiosyncratic choice	2	1 week	SSB-
6. Kim, 2005 – 1	BS	Comparing anxiety during exposure before and after specific rationale	Explanation of rationale	Explanation of rationale	Idiosyncratic SSBs	3	_	SSB-
7. Kim, 2005 – 2	BS	Comparing anxiety during exposure before and after specific rationale	Explanation of rationale	Explanation of rationale	Idiosyncratic SSBs	3	_	SSB-
8. Langer & Rodebaugh, 2013 – 1	BS	Comparing BL gaze behavior with decreasing (SSB+) eye contact and effect on anxiety and positive and negative affect	Get-to-know-you conversation with either other participant or experimenter	2 short (5min) social interactions	Gaze avoidance	3	_	SSB+
9. Langer & Rodebaugh, 2013 – 2	BS	Comparing BL gaze behavior with increasing (SSB-) eye contact and effect on anxiety and positive and negative affect	Get-to-know-you conversation with either other participant or experimenter	2 short (5min) social interactions	Gaze avoidance	3	_	SSB--
10. McManus et al., 2008	WS cross-over	Rate outcomes measures after each type of exposure	Two 5 min. conversations with a stranger	1 session: 5 min	Selected by researchers: typical for social anxiety	2	_	SSB-
11. Milosevic & Radomsky, 2008	BS	Responding before, during and after gradual in vivo exposure	Exposure to a live snake	1 session: 45 min	First selected by researchers, then	2	_	SSB+

					idiosyncratic choice			
12. Milosevic & Radomsky, 2013	BS	Comparing BL with use of safety gear (SSB+) on approach behavior (BAT) and fear	Exposure (approaching) to live tarantula	20 min interaction with spider	Use of safety gear	2	_	SSB+
13. Morgan & Raffle, 1999	BS	Exposure technique and cognitive elements for 3 weeks, with BT at d3 and d9	Graded exposure to idiosyncratic fears	10 days of group sessions (60 hours) and 1 week of home work	Idiosyncratic SSBs	2	_	SSB-
14. Powers et al., 2004	BS	Comparing BAT performance and self-report before and after in vivo exposure	Exposure to claustrophobic chamber	1 session: 6 x 5 min	Selected by researchers (three behaviors)	5	2 weeks	SSB+
15. Rachman et al., 2011	BS	Comparing ratings before and after allow SSB or not after touching a idiosyncratic contaminant	Touching a contaminant	2 sessions: 20 & 16 trials, resp.	Selected by researchers: using a hygienic wipe	2	_	SSB-
16. Salkovskis et al., 1999	BS	Comparing responding during a BT before and after exposure	Rationale + in vivo exposure	1 session: 15 min	Idiosyncratic SSBs	2	_	SSB-
17. Salkovskis et al., 2006	BS	Exposure based on habituation (maintain SSB) vs. CBT (exposure without SSB)	Rationale + in vivo exposure	3 sessions: 3.25 hrs.	Idiosyncratic SSBs	2	_	SSB-
18. Sloan & Telch, 2002	BS	Comparing BAT performance and self-report before and after exposure	Exposure to claustrophobic chamber	1 session: 6 x 5 min	Selected by researchers	3	2 weeks	SSB+
19. Sy et al., 2011	BS	Comparing BAT performance and self-report before and after exposure	Exposure to claustrophobic chamber	1 session: 6 x 5 min	Selected by researchers (three behaviors)	3	_	SSB+
20. Taylor & Alden, 2010 – 1	BS	Comparing responding to an experimental interaction after an exposure rationale	5-min. open-ended "getting acquainted" experimental interaction with a confederate	1 session: explanation of rationale + 2 min practice	Idiosyncratic SSBs	2	_	SSB-
21. Taylor & Alden, 2010 – 2	BS	Comparing responding to an experimental interaction after an exposure rationale	5-min. open-ended "getting acquainted" experimental interaction with a confederate	1 session: explanation of rationale + 2 min. practice	Idiosyncratic SSBs	2	_	SSB-
22. van den Hout et al., 2011	BS	Comparing ratings at beginning and end of each of 2 exposure sessions	Touching a contaminant 20 times	2 sessions: 20 trials each	Selected by researchers: using a hygienic wipe	3	_	SSB-

23. Wells et al., 1995	WS cross-over	BT before and after each type of exposure with ratings at 1 min , 3 min and end of test	Rationale + in vivo exposure to idiosyncratic feared social situation	1 session: 5 min	Idiosyncratic SSBs	2	_	SSB+

Note. BS= Between-subjects design; WS = Within-subjects design; BAT = Behavioral Approach Test; BT = Behavioral Test; BL= Baseline; SSB = Safety-seeking behavior; SSB- = Exposure without safety-seeking behavior; SSB+ = Exposure with safety-seeking behavior; d = days.

Appendix A

Keyword for intervention focus	Keyword for intervention target	Keyword for intervention type	Keyword for intervention means
Safety behav* Safety seeking behav*	Fear Anxi* Phobi*	Expos* Extinction Reduc* Maint*	Effect Group Program Intervention Treat*

<u>Formulation of the automatic search on PubMed</u>
(safety behav OR safety seeking behav*) AND (fear OR anxi*) and (expos* OR extinct* OR reduc* or maint*) AND (effect* OR group OR program* OR intervention OR treat*)*

<u>Adapted version for Web of Knowlegde</u>
TS = ((safety behav OR safety seeking behav*) AND (fear OR anxi*) and (expos* OR extinct * OR reduc* or maint*) AND (effect* OR group OR program* OR intervention OR treat*))*

<u>Adapted version for Wiley Interscience Journals</u>
safety behav OR safety seeking behav* in Abstract AND fear OR anxi* in Abstract AND expos* OR extinct* OR reduc* or maint* in Abstract AND effect* OR group OR program* OR intervention OR treat* in Abstract*